INSTRUCTIONS WITH PARTS LIST

FOR

WESTON®
MODEL 1272

BI POLAR
DIGITAL PANEL METER

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WESTON INSTRUMENTS DIVISION
WESTON INSTRUMENTS, INC.
614 FRELINGHUYSEN AVENUE, NEWARK, N. J. 07114
a Schlumberger company

F-3568 9/68 Printed in U.S.A.

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U.S. Patent 3,051,939
and Patents Pending

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GENERAL SPECIFICATIONS *

Accuracy	±0.1% of full scale ±1 digit
Conversion Rate (Readings/Second	5 (Standard) - Can be supplied for 10 to 1/10.
Power Requirements	117 Volts ±10%, 58 to 62 Hz, 12 watts. (Also operates on 400 Hz) (See following note).
Effective Series Mode Rejection	35 dB at 60 Hz for one digit error.
Weight	3 lbs approximately.

Refer to Table I for a tabulation of specifications pertaining to specific instruments.

NOTE

The Model 1272 is available as a 50 Hz unit, under a different type number. The 50 Hz unit also operates on 400 Hz.

* Specifications subject to change without notice.

TABLE 1.

TABLE OF SPECIFICATIONS*

WESTON PART NUMBER	RANGE (DC)	SENSITIVITY	INPUT IMPEDANCE	FULL x SCALE PRESENTATION	NAME PLATE DATA	MAXIMUM VOLTAGE OVERLOAD ⚡	EFFECTIVE COMMON MODE REJECTION at 60 Hz
1272-264845	100 Volts	0.1 V	1 Meg	± 99.9	Volts DC	1000	80 dB#
1272-264844	10 Volts	0.01 V	1 Meg	± 9.99	Volts DC	1000	80 dB#
1272-264843	1 Volt	0.001 V	100 K	± .999	Volts DC	200	80 db#
1272-264842	100 Millivolts	0.1 MV	10 K	± 99.9	Millivolts DC	100	80 dB#
1272-265403	100 Milliamperes	0.1 Ma	1 Ω	± 99.9	Milliamperes DC	-	-
1272-265402	10 Milliamperes	0.01 Ma	10 Ω	± 9.99	Milliamperes DC	-	-
1272-265401	1 Milliampere	0.001 Ma	100 Ω	± .999	Milliamperes DC	-	-
1272-265400	100 Microamperes	0.1 μa	1 K	± 99.9	Microamperes DC	-	-
1272-265339	10 Microamperes	0.01 μa	10 K	± 9.99	Microamperes DC	-	-

* Specifications subject to change without notice.
⚡ Maximum continuous voltage than can be applied to the meter without damage.
One digit error with unbalance of 100 ohms.
x See operation section, paragraph 3.

GENERAL

The Weston Model 1272 Bipolar Digital Panel Meter is a single range meter designed to indicate input DC voltage or current by means of numerical digits rather than the previously standard analog moving pointer method. It is provided with 3 digital display tubes for readout to three places. All design features are in keeping with panel meter usage but the digital concept provides linearity, high accuracy, stability and speed of reading without consideration of such factors as parallax, reader interpretation of tracking inherent in analog devices.

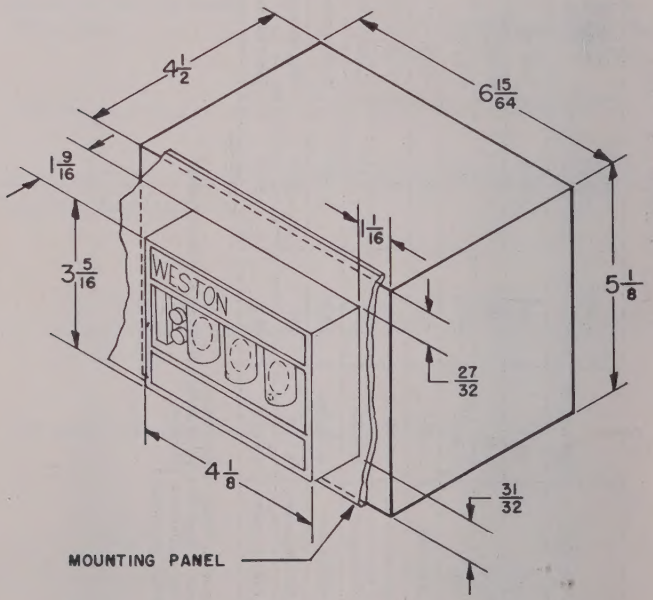


Figure 1. Outline Dimensional Drawing

An automatic Out Range light is provided to indicate that the meter is operating at its full scale point or beyond its normal range of operation.

Plus (+) and (-) Lamps are provided to indicate mode of operation.

A Remote control and three decades of 1-2-4-8 BCD (Binary Coded Decimal) are provided as additional special features. The Remote terminal is used to stop conversion and maintain the last reading displayed on the readout tubes and at the BCD output terminals. The BCD decades are used to provide outputs to drive external devices, such as printers.

The case front has a circularly polarized filter window to eliminate glare. Zero adjustment facilities are also provided. Through the use of the adjustment studs, which are accessible through the case front holes, adjustment may be made over a range of ±8 counts.

The meter is manufactured by Weston Instruments Division, Weston Instruments, Inc., Newark, New Jersey. All inquiries pertaining to operation or repair of this instrument should be directed to Weston-Newark. Refer to Figure 1, Outline Dimensional Drawing, for a pictorial view of the meter and overall dimensions.

PANEL MOUNTING

1. Unpack the meter and perform a visual inspection to assure that no damage has occurred during shipment or handling. Remove all packaging material.

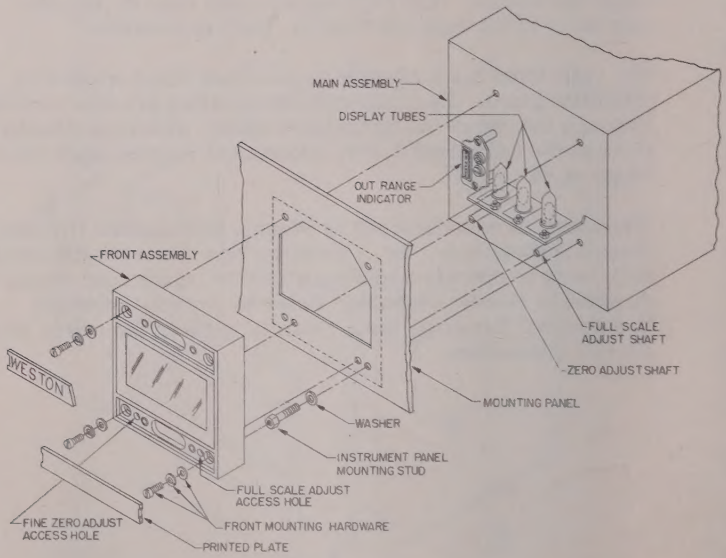


Figure 2. Meter Mounting Drawing

2. Mount the main assembly (See Figure 2) with the four studs and washers on a panel 1/16 to 1/8 inch thick prepared in accordance with the panel cut-out dimensions. (See Figure 3.)

3. Check display tubes to assure that they are securely mounted to their sockets. Press loose tubes down gently to obtain secure mounting.

4. The cover assembly may be mounted at this time, using mounting hardware as shown, or after electrical adjustments. The magnetic printed access plates are positioned in place after adjustments are made.

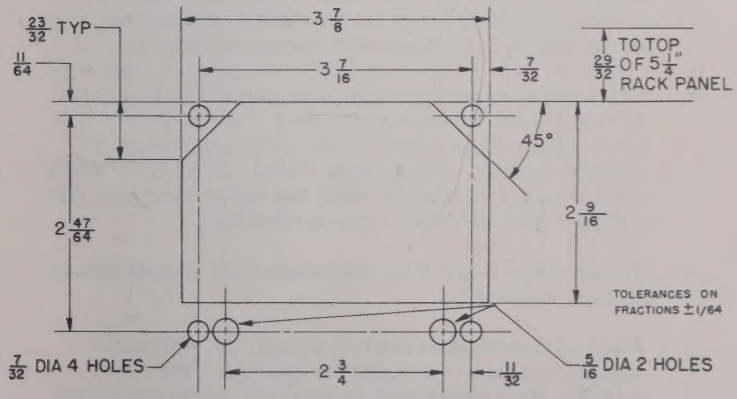


Figure 3. Panel Cut-Out Dimensions.

ELECTRICAL ADJUSTMENT AND OPERATION

1. After the meter has been panel mounted, connect a 117 V single phase power line to Terminals L, L, and GRD.

2. Connect a non-electrolytic 1 mfg capacitor between Input Terminals (-) and GRD.

NOTE

This connection is preferred to quieter operation. However, the meter may be operated "floating".

3. Allow meter to warm up for a period of 30 minutes.

4. Connect a jumper wire between Input Terminals (+) and (-). Rotate the left FINE ADJUST shaft with a screwdriver until the meter indicates 000, and either the (+) or (-) indicator is lit, and stable.

5. Remove the jumper wire between the (+) and (-) Input Terminals and connect a standard source to the (+) and (-) Input Terminals. With full scale voltage or current applied, rotate right FULL SCALE ADJUST shaft with a screwdriver until the meter indicates 000 and the OUT RANGE light is blinking.

6. Repeat steps 4 and 6 as necessary until proper adjustment is achieved.

7. When an overrange situation exists, ±1.100 volts applied to a one volt range for example, the OUT RANGE light blinks and the quantity displayed on the tubes is .100. However, the meter is capable of being operated beyond full scale range by 20%.

   For example the Operation Range of the one volt meter is ±1.200 Volts.

8. To stop the conversion and maintain the last reading on the display tubes and the BCD output terminals, the Model 1272 is equipped with a REMOTE terminal. By closing a switch between REMOTE and CIRCUIT GROUND the last conversion may be held for as long as desired. Connection of the REMOTE terminal to a short duration (+) 1 to 4 volt pulse, from the shorted condition, forces a conversion. Synchronization of a number of Model 1272 units can also be obtained by triggering the external Remote circuitry.

9. Three decades of 1-2-4-8 BCD (Binary Coded Decimal) are provided at the rear of the instrument to drive external devices. The rise and fall time of the output is compatible with Industrial RTL (Resistor-Transistor-Logic) micrologic or its equal. Logic levels are; logical 0, equal to or greater than 1.1 volt, and logical 1, equal to or less than 0.4 volt. For applications where other logic levels must be met, interface criteria should be coordinated with the factory.

10. The print command (P.C.) terminal is used to provide a 1.5 volt output signal when conversion from analog to digital is complete. The purpose of P.C. is to key the external devices (see step 8 for information acceptance.)

THEORY OF OPERATION

GENERAL

This section, in conjunction with the block diagram, Figure 4 and waveforms of Figure 5, contains a discussion of the theory of operation of the Model 1272 Digital Panel Meter.

Basically, the Model 1272 is a single range Digital Panel Meter that is capable of being constructed as a voltmeter or current meter with the addition of an appropriate attenuator or shunt. Standard self contained current or voltage ranges available from Weston are shown in Table 1.

The instrument utilizes a unique dual slope integrating technique designed with sampling intervals related to the power line frequency for measuring the time ratio of two events during a fixed period of time. For each readout four sampling intervals are required to balance the effect of the unknown input signal (I_{in}) and reduce the transient error to a negligible amount. Each sample of the four consists of two parts. During the first part the integrator composed of the microcircuit amplifier (Q309) and capacitor (c) is charged from the input signal (I_{in}). The output of the integrator is then restored to zero by the gated reference voltage fed back to the summing junction of the integrator. At the fourth sample interval, the three decades of readout, register the number of pulses arriving from the 480 KHz oscillator during the time the reference voltage is gated to the integrator.

From the waveforms shown in Figure 5 it can be shown that

$$(T - t3)\, KI_{in} = t4\, K\, (I_{REF} - I_{in}) \qquad (1)$$

but by the fourth sample $t_3 = t_4$ (within given accuracy), so that

$$t_4 = T \frac{I_{in}}{I_{REF}} \qquad (2)$$

The number of pulses counted during the time interval (t_4) is therefore proportional to the input signal.

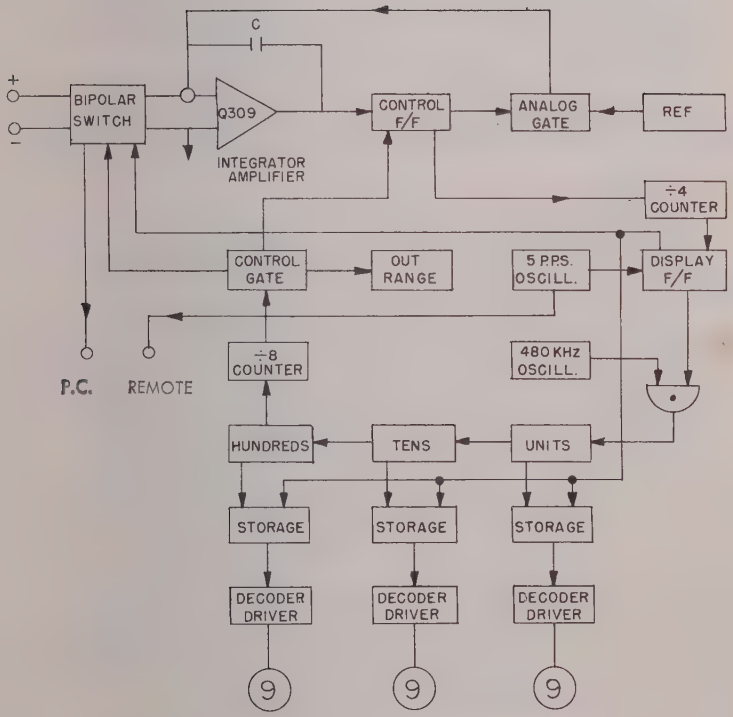


Figure 4. Block Diagram

307 = 5 PPS osc

Following the fourth sample the information in the decade counters is transferred to the storage register. The output of the storage register is in turn decoded to a ten line code for presentation by the three display tubes.

The measuring time for four samples lasts about 66 milliseconds (4 X 8,000) cycle pulse train generated by a 480 KHz clock).

OPERATION

A cycle of measurement is initiated by the 5 Hz clock resetting the display flip-flop, which in turn enables the "AND" gate permitting pulses to flow into the units decade counter. The combination of the three decade counters and the ÷ 8 count up to 7,800 where a pulse is delivered to the control flip-flop. The control flip-flop enables the analog gate forcing the amplifier to integrate back to zero. The zero crossing of the output of the amplifier causes the control flip-flop to trigger disabling the analog gate and feeding the first of four pulses to the ÷ 4 counter. The integrating capacitor now charges at a rate determined by the input signal plus a offset bias equal to 200 counts. The offset bias is deliberately used to eliminate possible indeterminacy around zero and improve series mode rejection. Compensation for the 200 offset is provided by the start of the capacitor discharge commencing at 7,800 in the counters rather than 8,000; a "200 pulses" discharge reading is equal to a zero signal input and a "1200 pulses" discharge reaching to full scale input.

When an interval of 8,000 pulses has again occurred (7,800 in counters) the control flip-flop will again be reset, enabling the analog a second time and forcing the integrator back to zero a second time. The zero crossing of the output of the amplifier causes the control flip-flop to trigger a second time disabling the analog gate and feeding the second of four pulses to the ÷4 counter. This sequence of events continues for the third and fourth samples. On the last sample however, the fourth pulse to the ÷ 4 counter triggers the display flip-flop and disables the "AND" gate. The information that is now in the counter decades is now transferred to the storage register for readout by the three display tubes.

The unit will remain in this static mode until the next pulse from the 5 Hz clock initiates a cycle.

The Model 1272 is a storage unit and although the counters are reset to zero, the display will record and hold only what has been accumulated in the digital counters during the fourth conversion.

When the input signal is equal to or above full scale input, the decade counters trigger a decoder, anded with the display flip-flop output to actuate the out range indicator.

When the input signal is less then zero (A negative input) the decade counters trigger a decoder anded with the display flip-flop and in turn triggers the under range flip-flop which causes a change of state in the polarity relay. Position of this relay determines direction of current flow to amplifier input and proper display of plus (+) or minus (-) indicators.

(The display will not indicate a reading below 000) Figure 6 is the schematic wiring diagram for Model 1272.

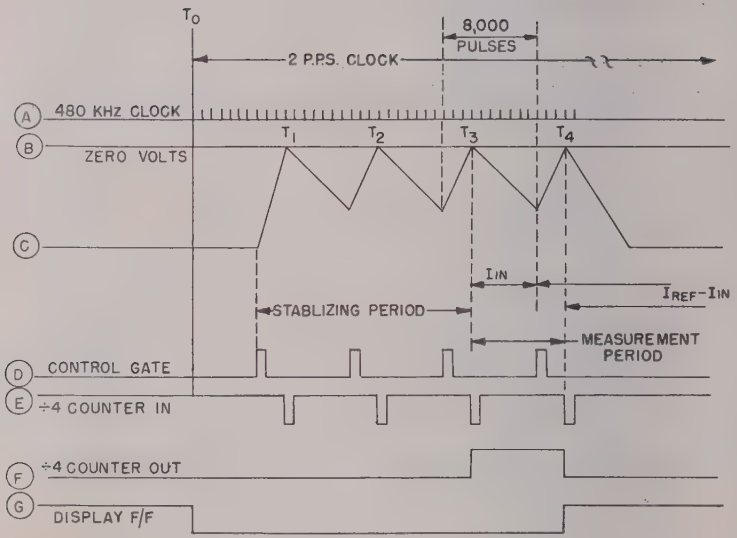
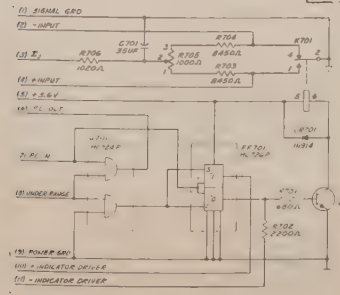


Figure 5. Waveforms

NOTES:

1. The location and wiring of decimal readout tube V503 is dependent upon the range of the instrument. The range shown is 100 (decimal tube on the right wired with decimal readout on left of digit). Refer to Table I for location of decimal tube for all other ranges.

2. Figure 6 is the basic diagram applicable to all meters listed in the Table of Specifications. In order to obtain the complete wiring for a specific range and function refer to the table on the next page for identification and location of additional components and connections required between terminals identified A-A1, B-B1, C-C1, D-D1, E-E1. See views A and B on back of diagram for actual physical location of components on Mother board A101.



DETAIL A 501

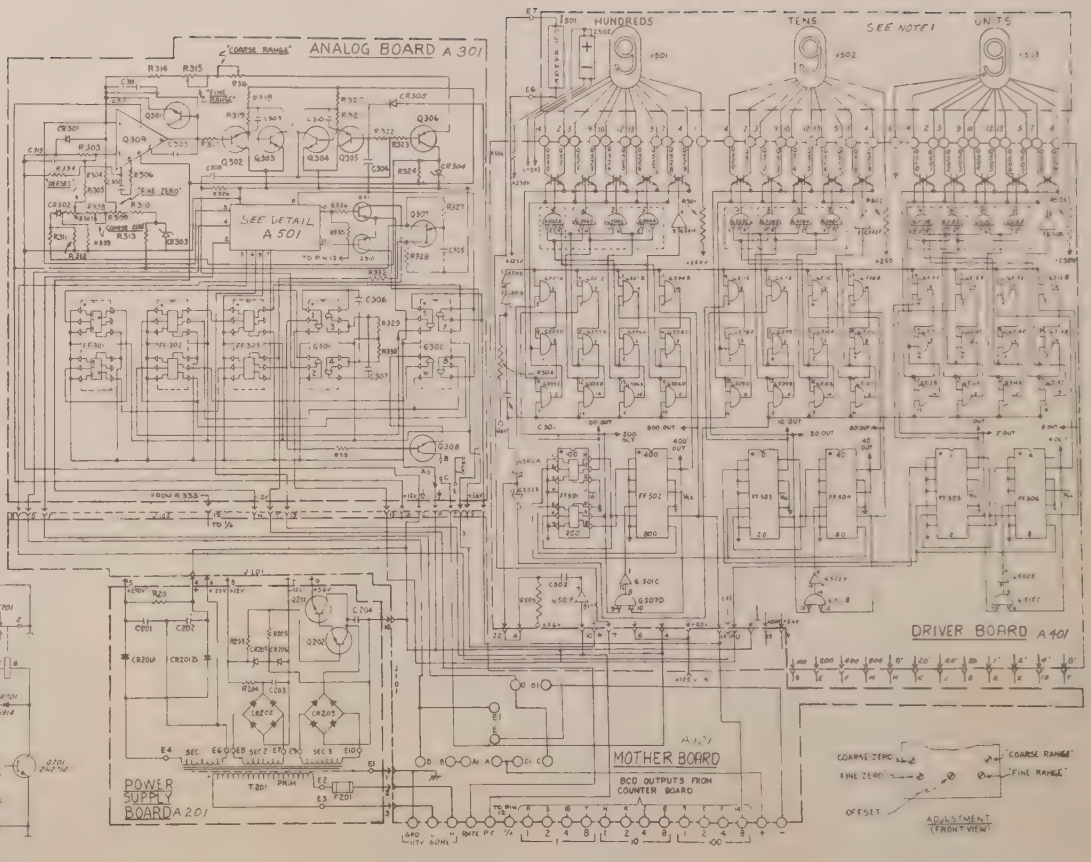
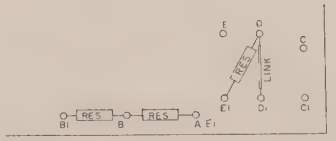


Figure 6. Schematic Wiring Diagram

FUNCTION & RANGE	COMPONENTS AND LOCATION BETWEEN TERMINALS (See Views A & B)				
	A-A1	B-B1	C-C1	A-E1	C-E1
100 VOLTS	265881-001	265881-001	--	--	266434-001
10 VOLTS	265881-001	266436-001	--	--	--
1 VOLT	266435-001	266466-001	--	--	--
100 M.V.	--	--	--	LINK	--
10 MICRO AMPS	--	--	--	LINK	--
100 MICRO AMPS	--	--	265891-001	LINK	--
1.0 M.A.	--	--	264775-001	LINK	--
10 M.A.	--	--	264773-001	LINK	--
100 M.A.	--	--	264776-001	LINK	--

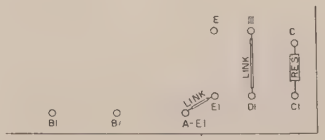
Components are supplied properly assembled on Mother Board Assembly.

The Link consists of #22 Gage Copper Wire (ND12867-000) cut to required length inside tubing (ND29890-001) also cut to length required.



View A. Voltage Range Component Connection Method. (See table for part numbers of components required for individual ranges.

COMPONENT IDENTIFICATION TABLE					
PART NUMBER	DESCRIPTION				
265881-001	RESISTOR	499 k	1/4 w	1%	M. F.
266436-001	RESISTOR	487 k	1/4 w	1%	M. F.
266466-001	RESISTOR	41.2 k	1/4 w	1%	M. F.
266435-001	RESISTOR	48.7 k	1/4 w	1%	M. F.
266434-001	RESISTOR	1100 Ω	1/4 w	1%	M. F.
265891-001	RESISTOR	1110 Ω	1/2 w	1%	M. F.
264775-001	RESISTOR	100 Ω	2 w	1%	W. W.
264773-001	RESISTOR	10 Ω	2 w	1%	W. W.
264776-001	RESISTOR	1 Ω	2 w	1%	W. W.



View B. Millivolt, Milliamp and Microamp Component Connection Method. (See table for part numbers of components required for individual ranges).

REPLACEMENT PARTS LIST

MODEL 1272

REFERENCE SYMBOL	DESCRIPTION	WESTON PART NO.
	ELECTRICAL COMPONENTS	
A101	CIRCUIT BOARD ASSEMBLY: Mother board	262086-901
A201	CIRCUIT BOARD ASSEMBLY: Power board	262212-901
A301	CIRCUIT BOARD ASSEMBLY: Analog board	262246-901
A401	CIRCUIT BOARD ASSEMBLY: Driver board	262235-901
A501	CIRCUIT BOARD ASSEMBLY: Bi Polar board	262228-901
C201, C202	CAPACITOR, ELECTROLYTIC: 20 μf 250 WVDC	ND27944-001
C203	CAPACITOR, ELECTROLYTIC: 100 μf 50 WVDC	264095-001
C204	CAPACITOR, ELECTROLYTIC: 2000 μf 25 WVDC	264096-001
C301	CAPACITOR, Package	265511-901
C302	CAPACITOR, MYLAR FILM: 0.0047 μf 100 WVDC	264092-001
C303	CAPACITOR, CERAMIC, DISC: 220 pf, 1000 WVDC	264091-001
C304, C309, C310	CAPACITOR, CERAMIC, DISC: 100 pf, 1000 WVDC	264089-001
C305	CAPACITOR, MYLAR FILM: 0.33 μf 100 WVDC	264094-001
C306, C307	CAPACITOR: 120, pf 500 WVDC	265802-001
C308	CAPACITOR, CERAMIC, DISC: 120 pf, 1000 WVDC	264090-001
C311	CAPACITOR, .0033 μf	Factory Select
C315	CAPACITOR, 1 μf 40v	266329-001
C501, C502	CAPACITOR, .001 μf	266417-001
F201	FUSE: 0.25 amp, Type 3AG, 125 volts	264079-001
G301, G302, G505, G509, G513	MICROCIRCUIT: Integrated, medium power, quad 2-input gate	264608-001
G501, G502	MICROCIRCUIT: Integrated, medium power, Hex inverter MC789P	264612-001
G503	MICROCIRCUIT: Integrated, low power Triple 3-input gate MC793P	264610-001

REFERENCE SYMBOL	DESCRIPTION	WESTON PART NO.
G504, G506, G507, G508, G510, G511, G512, G514, G515	MICROCIRCUIT: Integrated, low power, quad 2-input gate MC 717	264609-001
I501	INDICATOR: Out of Range, 125v	264032-001
I502	INDICATOR: Lamp plus	262197-001
	INDICATOR: Lamp minus	262198-001
J101	CONNECTOR RECEPTACLE: 20 contacts	264025-001
J102	CONNECTOR RECEPTACLE: 36 contacts	264024-001
J103	CONNECTOR RECEPTACLE: 44 contacts	264023-001
Q201	TRANSISTOR, SILICON POWER: 3 Amps	264607-001
Q202, Q301, Q302, Q305	TRANSISTOR: Type 2N2712	ND39917-001
Q303, Q304, Q306	TRANSISTOR: Type 2N3638	ND61280-001
Q307	TRANSISTOR, SILICON, UNIJUNCTION: 10 Amp peak	264606-001
Q308, Q310, Q311	TRANSISTOR, SILICON, HIGH VOLTAGE: 200 mw	264605-001
Q309	MICROCIRCUIT, AMPLIFIER: High gain 30,000 ±12 VDC	264611-001
Q501 thru Q530	TRANSISTOR, SILICON, HIGH VOLTAGE: 200 mw	264605-001
R201	RESISTOR, FIXED, COMPOSITION: 470K 1/2w	264779-001
R203	RESISTOR, FIXED, COMPOSITION: 1.8K ohms	266431-001
R204	RESISTOR, FIXED, COMPOSITION: 200 ohms, 1/2w	264778-001
R205	RESISTOR, 1.3K ohms	266432-001
R303	RESISTOR, FIXED, METAL FILM: 4.9K, 1/2w	264799-001
R304	RESISTOR, FIXED, METAL FILM:	Factory Select
R305	RESISTOR, FIXED, METAL FILM:	Factory Select
R306	RESISTOR, FIXED, COMPOSITION: 1.5k ohms	264083-001

REFERENCE SYMBOL	DESCRIPTION	WESTON PART NO.
R307	RESISTOR, VARIABLE: 5k ohms	261428-902
R308	RESISTOR, VARIABLE: 3k ohms	264098-001
R309	RESISTOR, VARIABLE: 500 ohms	261428-901
R310	RESISTOR, FIXED, METAL FILM:	Factory Select
R311	RESISTOR, FIXED, COMPOSITION: 12k	264084-001
R312, R323	RESISTOR, FIXED, COMPOSITION: 2.2k ohms	ND29948-001
R313, R324	RESISTOR, FIXED, COMPOSITION: 680 ohms	ND29717-001
R314	RESISTOR, FIXED, METAL FILM:	Factory Select
R315	RESISTOR, VARIABLE: 1k ohms	262068-901
R316	RESISTOR, VARIABLE: 4k ohms	ND39918-001
R317, R322	RESISTOR, FIXED, COMPOSITION: 100k	264086-001
R318, R320, R326	RESISTOR, FIXED, COMPOSITION: 6.8k ohms	ND28680-001
R319, R321	RESISTOR, FIXED, COMPOSITION: 39k	264085-001
R327	RESISTOR, FIXED, COMPOSITION: 820k	266420-001
R328	RESISTOR, FIXED, COMPOSITION: 100 ohms	264080-001
R331	RESISTOR 1.8k ohm	ND61010-001
R332	RESISTOR, FIXED 1k ohm	ND21591-001
R329, R330	RESISTOR, FIXED, COMPOSITION: 15k	ND28905-001
R333, R334	RESISTOR, FIXED, COMPOSITION:	Factory Select
R335, R336	RESISTOR, 2.2k	265866-001
R501 thru R503	RESISTOR, FIXED, COMPOSITION: 51k ±5%, 1w	ND24024-001
R504	RESISTOR 4.7k	263652-001
R505	RESISTOR 2.2k	265866-001
R506	RESISTOR 91k	266421-001
T201	TRANSFORMER: 117v primary to 97v, 28v, 7v Sections	261435-901
V501, V502	TUBE, READOUT	264034-001
V503	TUBE, READOUT: With decimal	264035-001

REFERENCE SYMBOL	DESCRIPTION	WESTON PART NO.
CR201A or, CR201B	BRIDGE, RECTIFIER: Single phase, voltage doubler, 0.5 to 1.0 amp output	264603-001
CR202	BRIDGE, RECTIFIER: Full wave, single phase 0.5 to 1.0 amp output	264604-001
CR203	BRIDGE, RECTIFIER: Full wave, single phase 1.5 amp output	264602-001
CR205, CR206	DIODE, ZENER:	264601-001
CR301, CR302, CR305	DIODE, SWITCHING: 100 peak inverse voltage	ND61025-001
CR303	DIODE, ZENER: 6.2 volts, 400 mw	263207-001
CR304	DIODE, ZENER: 6.2 volts, 250 mv, 0.005%/°C	ND60978-001
FF301 thru FF303	MICROCIRCUIT: Integrated, medium power Flip-Flop	264613-001
FF501 thru FF506	MICROCIRCUIT: Integrated, medium power, Flip-Flop	264613-001

HARDWARE PARTS (See figure 2.)

-----	PLATE, PRINTED, Magnetic (Identifies meter function)	261418
-----	PLATE, PRINTED, Magnetic (Model identification)	See Note
-----	FRONT ASSEMBLY	261397-901
-----	SCREW (Mounting front assembly)	ND30172-024
-----	WASHER, LOCK (Mounting front assembly)	ND37005-024
-----	WASHER, FLAT (Mounting front assembly)	251072-024
-----	STUD (Mounting main assembly to panel)	261426-045
-----	WASHER (Mounting main assembly to panel)	137259-024

Note: Order by stating Meter function.

WESTON EQUIPMENT WARRANTY

Weston warrants equipment of its manufacture against defective materials or workmanship for a period of one year from date of shipment.

The liability of Seller under this warranty is limited, at Seller's option, solely to repair, replacement with equivalent Weston equipment, at an appropriate credit adjustment not to exceed the original equipment sales price, of equipment returned to the Seller provided that (a) Seller is promptly notified in writing by Buyer upon discovery of defects, (b) Upon receipt of written authorization from Seller the defective equipment is returned as directed, transportation charges prepaid by Buyer, and, (c) Seller's examination of such equipment discloses to his satisfaction that defects were not caused by negligence, misuse, improper installation, accident, or unauthorized repair or alteration by the Buyer.

This warranty does not include mechanical parts failing from normal usage nor does it cover limited life electrical components which deteriorate with age such as tubes, lamps, etc.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranty of fitness for a particular purpose to the original purchaser or to any other person. Seller shall not be liable for consequential damages of any kind.

The aforementioned provisions do not extend the original warranty period of any article which has been either repaired or replaced by Seller.

MP MASTER
MA35430